

**PATENT APPLICATION**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Takeshi SAKAMOTO et al.

Group Art Unit: 1753

Application No.: 10/788,464

Examiner: E. WONG

Filed: March 1, 2004

Docket No.: 118870

For: METHOD OF MANUFACTURING RARE-EARTH MAGNET, AND PLATING  
BATH

**DECLARATION UNDER 37 C.F.R. §1.132**

I, Takeshi SAKAMOTO, a citizen of Japan, hereby declare and state:

1. I have a degree (Master's Course) in Applied Chemistry, which was conferred upon me by Hokkaido University in Sapporo, Japan in 1990.
2. I have been employed by TDK Corporation since 2000 and I have had a total of 7 years of work and research experience in Electrochemistry including Plating, Battery and the Corrosion Sciences.
3. I am a member of the Institution of Professional Engineers in Japan, the Electrochemical Society of Japan, the Surface Finishing Society of Japan, and Japan Society of Corrosion Engineering.
4. My publications include the following works in this field: "T. Sakamoto et al.", "Kei Kinzoku" (Light Metals), T. Sakamoto et al., Vol. 41, No. 8, 522 (1991).
5. I am a named inventor in the above-captioned patent application.
6. I have had a professional relationship with the assignee of the above-identified patent application for 7 years. I am not being compensated for my work in connection with this Declaration.
7. I am also qualified as a Professional Engineer in Chemistry (Japan).

8. I and/or those under my direct supervision and control have conducted the following tests in support of U.S. Patent Application No. 10/788,464:

Critical values of the concentration of a nickel source and conductivity of plating baths were tested in Comparative Examples 1-13 shown in the enclosed Tables 1 and 2, as discussed below. In Comparative Examples 1-13, rare-earth magnets were electroplated in plating baths to form a protective film. The corrosiveness of the protective films was then tested using a temperature high humidity and salt spray test. Except for the contents of the plating baths, all other experimental conditions and methods were identical to those from which the results in the U.S. Patent Application No. 10/788,464 application were conducted.

Specifically, a rare-earth magnet body (56x40x8(mm)), discussed on page 20 of the specification as originally filed, was used as a subject of these experiments. After cleaning with an alkaline degreasing liquid, the surface of the magnet body was activated by nitric acid fluid and rinsed with water. Then, a first protective film having a thickness of 5 $\mu$ m was applied to the surface of the magnet body. The first protective film was formed through barrel-type electroplating with a first plating bath including the composition and conductivity depicted in Tables 1 and 2 of the Amendment filed on March 15, 2007. After the formation of the first protective film, a second protective film having a thickness of 5 $\mu$ m was applied to the first protective film. The second protective film was formed through barrel-type electroplating with a second plating bath including the composition and conductivity depicted in Tables 1 and 2. In both steps of forming the protective films, current density averaged 1 A/dm<sup>2</sup> or less, and after each formation step, semi-brighteners could have optionally been used.

TABLE 1

Table 1 shows Comparative Examples 1-6, in which we developed protective films formed by electroplating rare-earth magnets in plating baths having various conductivities and molar concentrations of nickel. The weight ratio of the concentration of nickel ions to chlorine ions is 0.19 to 11.4.

The results of Table 1 indicate that even if the protective film was formed by electroplating with the use of the plating bath having a concentration of nickel source near, but outside, the range of 0.3 mol/l to 0.7 mol/l and having conductivity less than 80 mS/cm, the results of the corrosion tests, specifically the salt spray test, were substandard.

**TABLE 2**

Table 2 shows Comparative Examples 7-13, in which we developed protective films formed by electroplating rare-earth magnets in plating baths, including an organic acid as a buffer, having various conductivities and molar concentrations of nickel. The weight ratio of the concentration of nickel ions to chlorine ions is 0.19 to 11.4.

The results of Table 2 indicate that even if the protective film was formed by electroplating with the use of the plating bath having a concentration of nickel source near, but outside, the range of 0.3 mol/l to 0.7 mol/l, having conductivity less than 80 mS/cm and using an organic acid as a pH stabilizer, the results of the corrosion tests, specifically the salt spray test, were also substandard.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

Date: August, 1, 2007

Takeshi Sakamoto  
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